VOSH PROGRAM DIRECTIVE: **12-427** **ISSUED**: **01 May 2018**

Subject **Occupational Exposure to Beryllium, General Industry, §1910.1024**

Purpose **CHANGE II** transmits to field personnel a delay of the compliance date for the Beryllium in the Shipyard and Construction industries until 1 August 2018. **CHANGE I:** This directive transmits to field personnel the above-referenced standard.

This Program Directive is an internal guideline, not a statutory or regulatory rule, and is intended to provide instructions to VOSH personnel regarding internal operation of the Virginia Occupational Safety and Health Program and is solely for the benefit of the program. This document is not subject to the Virginia Register Act or the Administrative Process Act; it does not have general application and is not being enforced as having the force of law.

Scope This Directive applies VOSH-wide.

Reference **CHANGE II**: 82 FR 14439 (*21 March 2017*)
CHANGE I: 82 FR 2470 (*09 January 2017*)

Cancellation Not Applicable

Effective Date **CHANGE II**: *11 May 2018*
CHANGE I: *15 May 2017*

Expiration Date Not Applicable

Action Directors and Managers shall ensure that field personnel understand the standard in this Directive.

C. Ray Davenport
Commissioner

Distribution:
Commissioner of Labor and Industry
Assistant Commissioner
VOSH Directors and Managers
VOSH Legal Support & OIS Staffs
Cooperative Programs Manager
VOSH Compliance & Cooperative Programs Staffs
OSHA Region III & OSHA Norfolk Area Offices

When the guidelines, as set forth in this Program Directive, are applied to the Commissioner of the Department of Labor and Industry and/or to Virginia employers, the following federal terms if, and where they are used, shall be considered to read as below:

Federal Terms	VOSH Equivalent
OSHA	VOSH
Federal Agency	State Agency
Agency	Department
Regional Administrator	Assistant Commissioner
Area Director	Regional Director VOSH Program Director
Regional Solicitor	Attorney General or VOSH Division of Legal Support (DLS)
Office of Statistics	VOSH Research and Analysis
29 CFR	VOSH Standard
Compliance Safety and Health Officer (CSHO)	CSHO

I. Background

CHANGE II: On January 9, 2017, federal OSHA published in the *Federal Register* its final rule on the Occupational Exposure to Beryllium and Beryllium Compounds for three industries: General Industry (1910), Shipyard (1915) and Construction (1926). (*82 FR 2470*)

Federal OSHA concluded that employees exposed to beryllium and beryllium compounds at the preceding permissible exposure limits (PELs) were at significant risk of material impairment of health, specifically chronic beryllium disease and lung cancer. OSHA concluded that the new 8-hour time-weighted average (TWA) PEL of 0.2 $\mu g/m^3$ reduced this significant risk to the maximum extent feasible.

Subsequently, in accordance with the January 20, 2017 Presidential directive entitled, "Regulatory Freeze Pending Review," federal agencies were directed to consider for delay, beyond the initial 60-day period, the effective date for regulations that had not yet taken effect. OSHA reviewed the Beryllium standards, which had not become effective yet, and were scheduled to become effective on March 10, 2017. *(82 FR 8346)*

In compliance with this Presidential directive, on February 1, 2017, OSHA published a final rule in the *Federal Register*, which temporarily delayed the effective date for the Beryllium final rule for the Construction and Shipyards industries until March 21, 2017. Beryllium final rule for the General Industry was not included in the delay of the effective date. This delay gave OSHA the opportunity for review and consideration of new regulations, as required by the Presidential directive. *(82 FR 8901)*

On February 16, 2017, the Safety and Health Codes Board adopted federal OSHA's Final Rule on the Occupational Exposure to Beryllium for Parts 1910, 1915, and 1926, with an effective date of May 15, 2017, and with effective dates identical to federal OSHA's for implementation and compliance. Commencement of all obligations of this standard would be March 12, 2018, except for requirements that provide change rooms and showers would be March 11, 2019, and engineering controls would be March 10, 2020.

On March 21, 2017, after considering all comments received, OSHA finalized a delay of the effective date for the final rule on Beryllium in the *Federal Register* (*82 FR 14439*) for the Construction and Shipyard industries only. The General Industry Standard's effective date was not included and remains the same.

This general industry rule became effective nationally on May 20, 2017, following the delays of the original federal effective date of March 10, 2017, and became effective on May 15, 2017 in Virginia. However, compliance obligations both nationally, where federal OSHA has direct enforcement authority, and for VOSH in Virginia was scheduled to begin on March 12, 2018.

Having received approximately 2,500 comments urging it to adopt the proposal and delay the effective date, particularly for the construction and shipyards standards, OSHA decided not to enforce the January 9, 2017 Beryllium standards for both the Shipyard and Construction

industries, delaying them indefinitely. OSHA also proposed a new rulemaking for the Shipyard Industry, Part 1915, and for the Construction Industry, Part 1926, continuing the delay of enforcement for Parts 1915 and 1926 while the new rulemaking is underway (*82 FR 14439*).

On November 30, 2017, the Safety and Health Codes Board adopted a delay until August 1, 2018, of the compliance obligations of the Beryllium regulation for the public-sector Shipyard and Construction industries, 16VAC25-100-1915.1024 and 16VAC25-175-1926.1124, respectively. These regulations are identical to federal regulations 29 CFR 1915.1024 and 29 CFR 1926.1124, which have been subjected to an administrative stay of enforcement by federal OSHA. The compliance date for general industry remained unchanged – March 12, 2018.

In a Memorandum from federal OSHA, dated March 2, 2018, the General Industry standard for Beryllium and enforcement of the PEL and STEL in the construction and shipyard standards, were delayed by 60 days until May 11, 2018. The memo stated that no other parts of the construction and shipyard beryllium standards would be enforced without additional notice, and that no provisions of the beryllium final rule may be enforced until May 11, 2018. According to the memo, "if an employer fails to meet the new PEL or STEL, OSHA will inform the employer of the exposure levels and offer assistance to assure understanding and compliance." **Although the Safety and Health Codes Board has not acted on the March 12, 2018 federal OSHA memorandum, the compliance date for the General Industry standard will be May 11, 2018.**

CHANGE I: Beryllium is a strong, lightweight metal used in the aerospace, electronics, energy, telecommunication, medical, and defense industries. Beryllium-copper alloys are widely used because of their electrical and thermal conductivity, hardness, and good corrosion resistance.

When beryllium-containing materials are processed in a way that releases airborne beryllium dust, fumes, or mist into the air in the workplace, it is highly toxic. These airborne particles can be then inhaled by workers, potentially damaging their lungs and increasing their risk of developing chronic beryllium disease (CBD) or lung cancer.

The amended final standard replaces a 40-year old permissible exposure limit (PEL) for beryllium that was outdated and did not adequately protect worker health. OSHA had formally asked for public input on a possible beryllium rule in 2002 and rulemaking specialists visited work sites, performed risk assessments and calculated potential impacts on small businesses. In 2012, the effort received a boost when a major beryllium manufacturer and a labor union representing many beryllium workers jointly submitted a model for a new rule.

OSHA issued a proposed rule in 2015, followed by a months-long public comment period and several days of public hearings. The final standard reflects input from industry and labor stakeholders, small business representatives, subject matter experts, and partner agencies.

On February 16, 2017, the Safety and Health Codes Board adopted federal OSHA's Final Rule for the Occupational Exposure to Beryllium, §1910.1024, and Other Related Provisions, with an effective date of May 15, 2017, and with effective dates identical to federal OSHA's for implementation and compliance.

II. Summary

CHANGE II: Unlike federal OSHA's indefinite delay of compliance for Beryllium in the Construction and Shipyards industries, on November 30, 2017, the Safety and Health Codes Board adopted a delay of the compliance obligations of the Beryllium standard for the public-sector Shipyard and Construction industries until August 1, 2018, to allow the Department of Labor and Industry (DOLI) the opportunity to research the following issues:

- If the Board chose not to adopt OSHA's indefinite delay, would the federal identical standard(s) for Construction and public sector Shipyards industries be enforceable in Virginia;
- If not, would the Department research whether there was sufficient evidence in the OSHA administrative record that would enable the Board to use the OSHA record to support a full regulatory rulemaking in accordance with the Virginia Administrative Process Act.

These regulations are identical to federal regulations 29 CFR 1915.1024 and 29 CFR 1926.1124, which have been subjected to an administrative stay of enforcement by the federal OSHA.

As previously mentioned in this program directive, a federal OSHA memorandum, dated March 2, 2018, delayed the General Industry standard for Beryllium and enforcement of the PEL and STEL in the construction and shipyard standards for 60 day until May 11, 2018. **The Virginia compliance date for the General Industry standard will be May 11, 2018.**

CHANGE I:

A. General

OSHA has amended its existing standards for occupational exposure to beryllium and beryllium compounds because employees exposed to beryllium at the previous permissible exposure limits faced a significant risk of the material impairment to their health. Key provisions of this revised standard:

- Reduce the permissible exposure limit (PEL) for beryllium from 2.0 micrograms ($\mu g/m^3$) to 0.2 micrograms ($\mu g/m^3$) as an 8-hour time-weighted average. The PELs are the same for all employers covered by the standards. The new 8-hour TWA PEL represents a ten-fold decrease from the previous PEL.
- Establish a new short term exposure limit for beryllium of 2.0 $\mu g/m^3$ as a short-term exposure limit, determined over a sampling period of 15 minutes.

The standard also includes other provisions to protect employees, such as:

- requirements for exposure assessment;
- methods for controlling exposure;
- methods for controlling exposure;

- respiratory protection;
- personal protective clothing and equipment;
- housekeeping;
- medical surveillance;
- hazard communication; and
- recordkeeping.

The standard also includes Appendix A to §1910.1024 – Control Strategies to Minimize Beryllium Exposure (Non-Mandatory).

B. Health Hazards Caused by Exposure to Beryllium

Inhaling airborne beryllium can cause lung disease called Chronic Beryllium Disease (CBD), which is the primary health risk for beryllium workers. Exposures occur when beryllium and beryllium-containing materials are processed in a way that releases beryllium dust, fume, or mist into the workplace air. Worker exposures to beryllium may occur in foundry and smelting operations, fabricating, machining, grinding of beryllium metal and alloys, beryllium oxide ceramics manufacturing, and dental lab work.

CBD symptoms may include shortness of breath, fatigue, weight loss, fever, and night sweats. CBD can continue to progress even after a worker has been removed from exposure. Individuals must become sensitized to beryllium through inhalation or skin exposure before they can develop CBD. Occupational exposure to beryllium has also been linked to lung cancer.

C. Affected Industries

As mentioned previously, the beryllium standard, in effect, applies to occupational exposure to beryllium in all forms, compounds, and mixtures in general industry. Workers at coal-fired power plants may encounter beryllium when handling fly ash residue from the coal burning process.

This standard does not apply to material that contains beryllium and that the employer does not process. The final standard also exempts materials containing less than 0.1 percent beryllium by weight, if the employer has objective data demonstrating that employee exposure to beryllium will remain below the action level of 0.1 $\mu g/m^3$, as an 8-hour time weighted average, under any foreseeable conditions.

The following is a list of the main industries and application groups in general industry in which employees can reasonably be expected to be exposed to beryllium:

- Beryllium production
- Nonferrous Foundries
- Precision Turned Products
- Fabrication of Beryllium Alloy
- Beryllium Oxide Ceramics and Composites
- Secondary Smelting, Refining, and Alloying
- Copper Rolling, Drawing, and Extruding
- Welding

- Products
- Dental Laboratories

End products containing beryllium and beryllium compounds are used in many industries including:

- Aerospace: aircraft braking systems, engines, satellites, space telescope
- Automotive: anti-lock brake systems, ignitions
- Ceramic manufacturing: rocket covers, semiconductor chips
- Defense: components for nuclear weapons, missile parts, guidance systems, optical systems
- Dental labs: alloys in crowns, bridges, and dental plates
- Electronics: x-rays, computer parts, telecommunication parts, automotive parts
- Energy: microwave devices, relays
- Medicine: laser devices, electro-medical devices, X-ray windows
- Nuclear energy: heat shields, reactors
- Sporting goods: golf clubs, bicycles
- Telecommunications: optical systems, wireless base stations

III. Implementation/Compliance Schedule

CHANGE II: To help employers comply with the updated final rule and protect their workers, OSHA provided staggered compliance dates to ensure that employers have sufficient time to meet the requirements and get the right protections in place.

Beryllium Implementation/Compliance Schedule for Part 1910	OSHA Direct Enforcement States	Virginia
Effective date of standards	May 20, 2017	February 15, 2018
Commencement of all obligations of this standard except:	May 11, 2018	May 11, 2018
Requirement to provide change rooms and showers in paragraph (i)	March 11, 2019	March 11, 2019
Requirement for engineering controls required in paragraph (f)	March 10, 2020	March 10, 2020

CHANGE I: To help employers comply with the updated final standards and protect their workers, VOSH, like OSHA, provided staggered compliance dates to ensure that employers have sufficient time to meet the requirements and get the right protections in place. Where feasible, VOSH has adopted federal OSHA's effective dates:

Beryllium Implementation/Compliance Schedule for Part 1910	Virginia
Effective date of standards	May 15, 2017
Commencement of all obligations of this standard except:	March 12, 2018
Requirement to provide change rooms and showers in paragraph (i)	March 11, 2019
Requirement for engineering controls required in paragraph (f)	March 10, 2020

CHANGE I

Occupational Exposure to Beryllium, §1910.1024

As Adopted by the

Safety and Health Codes Board

Date: 16 February 2017

VIRGINIA DEPARTMENT OF LABOR AND INDUSTRY

VIRGINIA OCCUPATIONAL SAFETY AND HEALTH PROGRAM

VIRGINIA DEPARTENT OF LABOR AND INDUSTRY

Effective Date: 15 May 2017

16VAC25-90-1910.1024, Beryllium, §1910.1024

When the regulations, as set forth in the Final Rule for the Occupational Exposure to Beryllium, §1910.1024, are applied to the Commissioner of the Department of Labor and Industry and/or to Virginia employers, the following federal terms shall be considered to read as below:

Federal Terms	VOSH Equivalent
29 CFR	VOSH Standard
Assistant Secretary	Commissioner of Labor and Industry
Agency	Department
10 March 2017	15 May 2017

* * * * *

■ 3. Add § 1910.1024 to read as follows:

§ 1910.1024 Beryllium.

(a) *Scope and application.* (1) This standard applies to occupational exposure to beryllium in all forms, compounds, and mixtures in general industry, except those articles and materials exempted by paragraphs (a)(2) and (a)(3) of this standard.

(2) This standard does not apply to articles, as defined in the Hazard Communication standard (HCS) (§ 1910.1200(c)), that contain beryllium and that the employer does not process.

(3) This standard does not apply to materials containing less than 0.1% beryllium by weight where the employer has objective data demonstrating that employee exposure to beryllium will remain below the action level as an 8-hour TWA under any foreseeable conditions.

(b) *Definitions.* As used in this standard:

Action level means a concentration of airborne beryllium of 0.1 micrograms per cubic meter of air (μg/m^3) calculated as an 8-hour time-weighted average (TWA).

Airborne exposure and *airborne exposure to beryllium* mean the exposure to airborne beryllium that would occur if the employee were not using a respirator.

Assistant Secretary means the Assistant Secretary of Labor for Occupational Safety and Health, United States Department of Labor, or designee.

Beryllium lymphocyte proliferation test (BeLPT) means the measurement of blood lymphocyte proliferation in a laboratory test when lymphocytes are challenged with a soluble beryllium salt.

Beryllium work area means any work area containing a process or operation that can release beryllium where employees are, or can reasonably be expected to be, exposed to airborne beryllium at any level or where there is the potential for dermal contact with beryllium.

CBD diagnostic center means a medical diagnostic center that has an on-site pulmonary specialist and on-site facilities to perform a clinical evaluation for the presence of chronic beryllium disease (CBD). This evaluation must include pulmonary function testing (as outlined by the American Thoracic Society criteria), bronchoalveolar lavage (BAL), and transbronchial biopsy. The CBD diagnostic center must also have the capacity to transfer BAL samples to a laboratory for appropriate diagnostic testing within 24 hours. The on-site pulmonary specialist must be able to interpret the biopsy pathology and the BAL diagnostic test results.

Chronic beryllium disease (CBD) means a chronic lung disease associated with airborne exposure to beryllium.

Confirmed positive means the person tested has beryllium sensitization, as indicated by two abnormal BeLPT test results, an abnormal and a borderline test result, or three borderline test results. It also means the result of a more reliable and accurate test indicating a person has been identified as having beryllium sensitization.

Director means the Director of the National Institute for Occupational Safety and Health (NIOSH), U.S. Department of Health and Human Services, or designee.

Emergency means any uncontrolled release of airborne beryllium.

High-efficiency particulate air (HEPA) filter means a filter that is at least 99.97 percent efficient in removing particles 0.3 micrometers in diameter.

Objective data means information, such as air monitoring data from industry-wide surveys or calculations based on the composition of a substance, demonstrating airborne exposure to beryllium associated with a particular product or material or a specific process, task, or activity. The data must reflect workplace conditions closely resembling or with a higher airborne exposure potential than the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations.

Physician or other licensed health care professional (PLHCP) means an individual whose legally permitted scope of practice (*i.e.,* license, registration, or certification) allows the individual to independently provide or be delegated the responsibility to provide some or all of the health care services required by paragraph (k) of this standard.

Regulated area means an area, including temporary work areas where maintenance or non-routine tasks are performed, where an employee's airborne exposure exceeds, or can reasonably be expected to exceed, either the time-weighted average (TWA) permissible exposure limit (PEL) or short term exposure limit (STEL).

This standard means this beryllium standard, 29 CFR 1910.1024.

(c) *Permissible Exposure Limits (PELs)*—(1) *Time-weighted average (TWA) PEL.* The employer must ensure that no employee is exposed to an airborne concentration of beryllium in excess of 0.2 μg/m^3 calculated as an 8-hour TWA.

(2) *Short-term exposure limit (STEL).* The employer must ensure that no employee is exposed to an airborne concentration of beryllium in excess of 2.0 μg/m^3 as determined over a sampling period of 15 minutes.

(d) *Exposure assessment*—(1) *General.* The employer must assess the airborne exposure of each employee who is or may reasonably be expected to be exposed to airborne beryllium in accordance with either the performance option in paragraph (d)(2) or the scheduled monitoring option in paragraph (d)(3) of this standard.

(2) *Performance option.* The employer must assess the 8-hour TWA exposure and the 15-minute short-term exposure for each employee on the basis of any combination of air monitoring data and objective data sufficient to accurately characterize airborne exposure to beryllium.

(3) *Scheduled monitoring option.* (i) The employer must perform initial monitoring to assess the 8-hour TWA exposure for each employee on the basis of one or more personal breathing zone air samples that reflect the airborne

exposure of employees on each shift, for each job classification, and in each work area.

(ii) The employer must perform initial monitoring to assess the short-term exposure from 15-minute personal breathing zone air samples measured in operations that are likely to produce airborne exposure above the STEL for each work shift, for each job classification, and in each work area.

(iii) Where several employees perform the same tasks on the same shift and in the same work area, the employer may sample a representative fraction of these employees in order to meet the requirements of this paragraph (d)(3). In representative sampling, the employer must sample the employee(s) expected to have the highest airborne exposure to beryllium.

(iv) If initial monitoring indicates that airborne exposure is below the action level and at or below the STEL, the employer may discontinue monitoring for those employees whose airborne exposure is represented by such monitoring.

(v) Where the most recent exposure monitoring indicates that airborne exposure is at or above the action level but at or below the TWA PEL, the employer must repeat such monitoring within six months of the most recent monitoring.

(vi) Where the most recent exposure monitoring indicates that airborne exposure is above the TWA PEL, the employer must repeat such monitoring within three months of the most recent 8-hour TWA exposure monitoring.

(vii) Where the most recent (non-initial) exposure monitoring indicates that airborne exposure is below the action level, the employer must repeat such monitoring within six months of the most recent monitoring until two consecutive measurements, taken 7 or more days apart, are below the action level, at which time the employer may discontinue 8-hour TWA exposure monitoring for those employees whose exposure is represented by such monitoring, except as otherwise provided in paragraph (d)(4) of this standard.

(viii) Where the most recent exposure monitoring indicates that airborne exposure is above the STEL, the employer must repeat such monitoring within three months of the most recent short-term exposure monitoring until two consecutive measurements, taken 7 or more days apart, are below the STEL, at which time the employer may discontinue short-term exposure monitoring for those employees whose exposure is represented by such monitoring, except as otherwise provided in paragraph (d)(4) of this standard.

(4) *Reassessment of exposure.* The employer must reassess airborne exposure whenever a change in the production, process, control equipment, personnel, or work practices may reasonably be expected to result in new or additional airborne exposure at or above the action level or STEL, or when the employer has any reason to believe that new or additional airborne exposure at or above the action level or STEL has occurred.

(5) *Methods of sample analysis.* The employer must ensure that all air monitoring samples used to satisfy the monitoring requirements of paragraph (d) of this standard are evaluated by a laboratory that can measure beryllium to an accuracy of plus or minus 25 percent within a statistical confidence level of 95 percent for airborne concentrations at or above the action level.

(6) *Employee notification of assessment results.* (i) Within 15 working days after completing an exposure assessment in accordance with paragraph (d) of this standard, the employer must notify each employee whose airborne exposure is represented by the assessment of the results of that assessment individually in writing or post the results in an appropriate location that is accessible to each of these employees.

(ii) Whenever an exposure assessment indicates that airborne exposure is above the TWA PEL or STEL, the employer must describe in the written notification the corrective action being taken to reduce airborne exposure to or below the exposure limit(s) exceeded where feasible corrective action exists but had not been implemented when the monitoring was conducted.

(7) *Observation of monitoring.* (i) The employer must provide an opportunity to observe any exposure monitoring required by this standard to each employee whose airborne exposure is measured or represented by the monitoring and each employee's representative(s).

(ii) When observation of monitoring requires entry into an area where the use of personal protective clothing or equipment (which may include respirators) is required, the employer must provide each observer with appropriate personal protective clothing and equipment at no cost to the observer and must ensure that each observer uses such clothing and equipment.

(iii) The employer must ensure that each observer follows all other applicable safety and health procedures.

(e) *Beryllium work areas and regulated areas*—(1) *Establishment.* (i) The employer must establish and maintain a beryllium work area wherever the criteria for a "beryllium work area" set forth in paragraph (b) of this standard are met.

(ii) The employer must establish and maintain a regulated area wherever employees are, or can reasonably be expected to be, exposed to airborne beryllium at levels above the TWA PEL or STEL.

(2) *Demarcation.* (i) The employer must identify each beryllium work area through signs or any other methods that adequately establish and inform each employee of the boundaries of each beryllium work area.

(ii) The employer must identify each regulated area in accordance with paragraph (m)(2) of this standard.

(3) *Access.* The employer must limit access to regulated areas to:

(i) Persons the employer authorizes or requires to be in a regulated area to perform work duties;

(ii) Persons entering a regulated area as designated representatives of employees for the purpose of exercising the right to observe exposure monitoring procedures under paragraph (d)(7) of this standard; and

(iii) Persons authorized by law to be in a regulated area.

(4) *Provision of personal protective clothing and equipment, including respirators.* The employer must provide and ensure that each employee entering a regulated area uses:

(i) Respiratory protection in accordance with paragraph (g) of this standard; and

(ii) Personal protective clothing and equipment in accordance with paragraph (h) of this standard.

(f) *Methods of compliance*—(1) *Written exposure control plan.* (i) The employer must establish, implement, and maintain a written exposure control plan, which must contain:

(A) A list of operations and job titles reasonably expected to involve airborne exposure to or dermal contact with beryllium;

(B) A list of operations and job titles reasonably expected to involve airborne exposure at or above the action level;

(C) A list of operations and job titles reasonably expected to involve airborne exposure above the TWA PEL or STEL;

(D) Procedures for minimizing cross-contamination, including preventing the transfer of beryllium between surfaces, equipment, clothing, materials, and articles within beryllium work areas;

(E) Procedures for keeping surfaces as free as practicable of beryllium;

(F) Procedures for minimizing the migration of beryllium from beryllium work areas to other locations within or outside the workplace;

(G) A list of engineering controls, work practices, and respiratory protection required by paragraph (f)(2) of this standard;

(H) A list of personal protective clothing and equipment required by paragraph (h) of this standard; and

(I) Procedures for removing, laundering, storing, cleaning, repairing, and disposing of beryllium-contaminated personal protective clothing and equipment, including respirators.

(ii) The employer must review and evaluate the effectiveness of each written exposure control plan at least annually and update it, as necessary, when:

(A) Any change in production processes, materials, equipment, personnel, work practices, or control methods results, or can reasonably be expected to result, in new or additional airborne exposure to beryllium;

(B) The employer is notified that an employee is eligible for medical removal in accordance with paragraph (l)(1) of this standard, referred for evaluation at a CBD diagnostic center, or shows signs or symptoms associated with airborne exposure to or dermal contact with beryllium; or

(C) The employer has any reason to believe that new or additional airborne exposure is occurring or will occur.

(iii) The employer must make a copy of the written exposure control plan accessible to each employee who is, or can reasonably be expected to be, exposed to airborne beryllium in accordance with OSHA's Access to Employee Exposure and Medical Records (Records Access) standard (§ 1910.1020(e)).

(2) *Engineering and work practice controls.* (i) For each operation in a beryllium work area that releases airborne beryllium, the employer must ensure that at least one of the following is in place to reduce airborne exposure:

(A) Material and/or process substitution;

(B) Isolation, such as ventilated partial or full enclosures;

(C) Local exhaust ventilation, such as at the points of operation, material handling, and transfer; or

(D) Process control, such as wet methods and automation.

(ii) An employer is exempt from using the controls listed in paragraph (f)(2)(i) of this standard to the extent that:

(A) The employer can establish that such controls are not feasible; or

(B) The employer can demonstrate that airborne exposure is below the action level, using no fewer than two representative personal breathing zone samples taken at least 7 days apart, for each affected operation.

(iii) If airborne exposure exceeds the TWA PEL or STEL after implementing the control(s) required by paragraph (f)(2)(i) of this standard, the employer must implement additional or enhanced engineering and work practice controls to reduce airborne exposure to or below the exposure limit(s) exceeded.

(iv) Wherever the employer demonstrates that it is not feasible to reduce airborne exposure to or below the PELs by the engineering and work practice controls required by paragraphs (f)(2)(i) and (f)(2)(iii) of this standard, the employer must implement and maintain engineering and work practice controls to reduce airborne exposure to the lowest levels feasible and supplement these controls by using respiratory protection in accordance with paragraph (g) of this standard.

(3) *Prohibition of rotation.* The employer must not rotate employees to different jobs to achieve compliance with the PELs.

(g) *Respiratory protection*—(1) *General.* The employer must provide respiratory protection at no cost to the employee and ensure that each employee uses respiratory protection:

(i) During periods necessary to install or implement feasible engineering and work practice controls where airborne exposure exceeds, or can reasonably be expected to exceed, the TWA PEL or STEL;

(ii) During operations, including maintenance and repair activities and non-routine tasks, when engineering and work practice controls are not feasible and airborne exposure exceeds, or can reasonably be expected to exceed, the TWA PEL or STEL;

(iii) During operations for which an employer has implemented all feasible engineering and work practice controls when such controls are not sufficient to reduce airborne exposure to or below the TWA PEL or STEL;

(iv) During emergencies; and

(v) When an employee who is eligible for medical removal under paragraph (l)(1) chooses to remain in a job with airborne exposure at or above the action level, as permitted by paragraph (l)(2)(ii) of this standard.

(2) *Respiratory protection program.* Where this standard requires an employer to provide respiratory protection, the selection and use of such respiratory protection must be in accordance with the Respiratory Protection standard (§ 1910.134).

(3) The employer must provide at no cost to the employee a powered air-purifying respirator (PAPR) instead of a negative pressure respirator when

(i) Respiratory protection is required by this standard;

(ii) An employee entitled to such respiratory protection requests a PAPR; and

(iii) The PAPR provides adequate protection to the employee in accordance with paragraph (g)(2) of this standard.

(h) *Personal protective clothing and equipment*—(1) *Provision and use.* The employer must provide at no cost, and ensure that each employee uses, appropriate personal protective clothing and equipment in accordance with the written exposure control plan required under paragraph (f)(1) of this standard and OSHA's Personal Protective Equipment standards (subpart I of this part):

(i) Where airborne exposure exceeds, or can reasonably be expected to exceed, the TWA PEL or STEL; or

(ii) Where there is a reasonable expectation of dermal contact with beryllium.

(2) *Removal and storage.* (i) The employer must ensure that each employee removes all beryllium-contaminated personal protective clothing and equipment at the end of the work shift, at the completion of tasks involving beryllium, or when personal protective clothing or equipment becomes visibly contaminated with beryllium, whichever comes first.

(ii) The employer must ensure that each employee removes beryllium-contaminated personal protective clothing and equipment as specified in the written exposure control plan required by paragraph (f)(1) of this standard.

(iii) The employer must ensure that each employee stores and keeps beryllium-contaminated personal protective clothing and equipment separate from street clothing and that storage facilities prevent cross-contamination as specified in the written exposure control plan required by paragraph (f)(1) of this standard.

(iv) The employer must ensure that no employee removes beryllium-contaminated personal protective clothing or equipment from the workplace, except for employees authorized to do so for the purposes of laundering, cleaning, maintaining or disposing of beryllium-contaminated personal protective clothing and equipment at an appropriate location or facility away from the workplace.

(v) When personal protective clothing or equipment required by this standard is removed from the workplace for laundering, cleaning, maintenance or disposal, the employer must ensure that

personal protective clothing and equipment are stored and transported in sealed bags or other closed containers that are impermeable and are labeled in accordance with paragraph (m)(3) of this standard and the HCS (§ 1910.1200).

(3) *Cleaning and replacement.* (i) The employer must ensure that all reusable personal protective clothing and equipment required by this standard is cleaned, laundered, repaired, and replaced as needed to maintain its effectiveness.

(ii) The employer must ensure that beryllium is not removed from personal protective clothing and equipment by blowing, shaking or any other means that disperses beryllium into the air.

(iii) The employer must inform in writing the persons or the business entities who launder, clean or repair the personal protective clothing or equipment required by this standard of the potentially harmful effects of airborne exposure to and dermal contact with beryllium and that the personal protective clothing and equipment must be handled in accordance with this standard.

(i) *Hygiene areas and practices*—(1) *General.* For each employee working in a beryllium work area, the employer must:

(i) Provide readily accessible washing facilities in accordance with this standard and the Sanitation standard (§ 1910.141) to remove beryllium from the hands, face, and neck; and

(ii) Ensure that employees who have dermal contact with beryllium wash any exposed skin at the end of the activity, process, or work shift and prior to eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or using the toilet.

(2) *Change rooms.* In addition to the requirements of paragraph (i)(1)(i) of this standard, the employer must provide employees who work in a beryllium work area with a designated change room in accordance with this standard and the Sanitation standard (§ 1910.141) where employees are required to remove their personal clothing.

(3) *Showers.* (i) The employer must provide showers in accordance with the Sanitation standard (§ 1910.141) where:

(A) Airborne exposure exceeds, or can reasonably be expected to exceed, the TWA PEL or STEL; and

(B) Beryllium can reasonably be expected to contaminate employees' hair or body parts other than hands, face, and neck.

(ii) Employers required to provide showers under paragraph (i)(3)(i) of this standard must ensure that each employee showers at the end of the work shift or work activity if:

(A) The employee reasonably could have had airborne exposure above the TWA PEL or STEL; and

(B) Beryllium could reasonably have contaminated the employee's hair or body parts other than hands, face, and neck.

(4) *Eating and drinking areas.* Wherever the employer allows employees to consume food or beverages at a worksite where beryllium is present, the employer must ensure that:

(i) Surfaces in eating and drinking areas are as free as practicable of beryllium;

(ii) No employees enter any eating or drinking area with personal protective clothing or equipment unless, prior to entry, surface beryllium has been removed from the clothing or equipment by methods that do not disperse beryllium into the air or onto an employee's body; and

(iii) Eating and drinking facilities provided by the employer are in accordance with the Sanitation standard (§ 1910.141).

(5) *Prohibited activities.* The employer must ensure that no employees eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas.

(j) *Housekeeping*—(1) *General.* (i) The employer must maintain all surfaces in beryllium work areas as free as practicable of beryllium and in accordance with the written exposure control plan required under paragraph (f)(1) and the cleaning methods required under paragraph (j)(2) of this standard; and

(ii) The employer must ensure that all spills and emergency releases of beryllium are cleaned up promptly and in accordance with the written exposure control plan required under paragraph (f)(1) and the cleaning methods required under paragraph (j)(2) of this standard.

(2) *Cleaning methods.* (i) The employer must ensure that surfaces in beryllium work areas are cleaned by HEPA-filtered vacuuming or other methods that minimize the likelihood and level of airborne exposure.

(ii) The employer must not allow dry sweeping or brushing for cleaning surfaces in beryllium work areas unless HEPA-filtered vacuuming or other methods that minimize the likelihood and level of airborne exposure are not safe or effective.

(iii) The employer must not allow the use of compressed air for cleaning beryllium-contaminated surfaces unless the compressed air is used in conjunction with a ventilation system designed to capture the particulates made airborne by the use of compressed air.

(iv) Where employees use dry sweeping, brushing, or compressed air to clean beryllium-contaminated surfaces, the employer must provide, and ensure that each employee uses, respiratory protection and personal protective clothing and equipment in accordance with paragraphs (g) and (h) of this standard.

(v) The employer must ensure that cleaning equipment is handled and maintained in a manner that minimizes the likelihood and level of airborne exposure and the re-entrainment of airborne beryllium in the workplace.

(3) *Disposal.* The employer must ensure that:

(i) Materials designated for disposal that contain or are contaminated with beryllium are disposed of in sealed, impermeable enclosures, such as bags or containers, that are labeled in accordance with paragraph (m)(3) of this standard; and

(ii) Materials designated for recycling that contain or are contaminated with beryllium are cleaned to be as free as practicable of surface beryllium contamination and labeled in accordance with paragraph (m)(3) of this standard, or placed in sealed, impermeable enclosures, such as bags or containers, that are labeled in accordance with paragraph (m)(3) of this standard.

(k) *Medical surveillance*—(1) *General.* (i) The employer must make medical surveillance required by this paragraph available at no cost to the employee, and at a reasonable time and place, to each employee:

(A) Who is or is reasonably expected to be exposed at or above the action level for more than 30 days per year;

(B) Who shows signs or symptoms of CBD or other beryllium-related health effects;

(C) Who is exposed to beryllium during an emergency; or

(D) Whose most recent written medical opinion required by paragraph (k)(6) or (k)(7) of this standard recommends periodic medical surveillance.

(ii) The employer must ensure that all medical examinations and procedures required by this standard are performed by, or under the direction of, a licensed physician.

(2) *Frequency.* The employer must provide a medical examination:

(i) Within 30 days after determining that:

(A) An employee meets the criteria of paragraph (k)(1)(i)(A), unless the employee has received a medical examination, provided in accordance

with this standard, within the last two years; or

(B) An employee meets the criteria of paragraph (k)(1)(i)(B) or (C).

(ii) At least every two years thereafter for each employee who continues to meet the criteria of paragraph (k)(1)(i)(A), (B), or (D) of this standard.

(iii) At the termination of employment for each employee who meets any of the criteria of paragraph (k)(1)(i) of this standard at the time the employee's employment terminates, unless an examination has been provided in accordance with this standard during the six months prior to the date of termination.

(3) *Contents of examination.* (i) The employer must ensure that the PLHCP conducting the examination advises the employee of the risks and benefits of participating in the medical surveillance program and the employee's right to opt out of any or all parts of the medical examination.

(ii) The employer must ensure that the employee is offered a medical examination that includes:

(A) A medical and work history, with emphasis on past and present airborne exposure to or dermal contact with beryllium, smoking history, and any history of respiratory system dysfunction;

(B) A physical examination with emphasis on the respiratory system;

(C) A physical examination for skin rashes;

(D) Pulmonary function tests, performed in accordance with the guidelines established by the American Thoracic Society including forced vital capacity (FVC) and forced expiratory volume in one second (FEV_1);

(E) A standardized BeLPT or equivalent test, upon the first examination and at least every two years thereafter, unless the employee is confirmed positive. If the results of the BeLPT are other than normal, a follow-up BeLPT must be offered within 30 days, unless the employee has been confirmed positive. Samples must be analyzed in a laboratory certified under the College of American Pathologists/ Clinical Laboratory Improvement Amendments (CLIA) guidelines to perform the BeLPT.

(F) A low dose computed tomography (LDCT) scan, when recommended by the PLHCP after considering the employee's history of exposure to beryllium along with other risk factors, such as smoking history, family medical history, sex, age, and presence of existing lung disease; and

(G) Any other test deemed appropriate by the PLHCP.

(4) *Information provided to the PLHCP.* The employer must ensure that the examining PLHCP (and the agreed-upon CBD diagnostic center, if an evaluation is required under paragraph (k)(7) of this standard) has a copy of this standard and must provide the following information, if known:

(i) A description of the employee's former and current duties that relate to the employee's airborne exposure to and dermal contact with beryllium;

(ii) The employee's former and current levels of airborne exposure;

(iii) A description of any personal protective clothing and equipment, including respirators, used by the employee, including when and for how long the employee has used that personal protective clothing and equipment; and

(iv) Information from records of employment-related medical examinations previously provided to the employee, currently within the control of the employer, after obtaining written consent from the employee.

(5) *Licensed physician's written medical report for the employee.* The employer must ensure that the employee receives a written medical report from the licensed physician within 45 days of the examination (including any follow-up BeLPT required under paragraph (k)(3)(ii)(E) of this standard) and that the PLHCP explains the results of the examination to the employee. The written medical report must contain:

(i) A statement indicating the results of the medical examination, including the licensed physician's opinion as to whether the employee has

(A) Any detected medical condition, such as CBD or beryllium sensitization (*i.e.*, the employee is confirmed positive, as defined in paragraph (b) of this standard), that may place the employee at increased risk from further airborne exposure, and

(B) Any medical conditions related to airborne exposure that require further evaluation or treatment.

(ii) Any recommendations on:

(A) The employee's use of respirators, protective clothing, or equipment; or

(B) Limitations on the employee's airborne exposure to beryllium.

(iii) If the employee is confirmed positive or diagnosed with CBD or if the licensed physician otherwise deems it appropriate, the written report must also contain a referral for an evaluation at a CBD diagnostic center.

(iv) If the employee is confirmed positive or diagnosed with CBD the written report must also contain a recommendation for continued periodic medical surveillance.

(v) If the employee is confirmed positive or diagnosed with CBD the written report must also contain a recommendation for medical removal from airborne exposure to beryllium, as described in paragraph (l) of this standard.

(6) *Licensed physician's written medical opinion for the employer.* (i) The employer must obtain a written medical opinion from the licensed physician within 45 days of the medical examination (including any follow-up BeLPT required under paragraph (k)(3)(ii)(E) of this standard). The written medical opinion must contain only the following:

(A) The date of the examination;

(B) A statement that the examination has met the requirements of this standard;

(C) Any recommended limitations on the employee's use of respirators, protective clothing, or equipment; and

(D) A statement that the PLHCP has explained the results of the medical examination to the employee, including any tests conducted, any medical conditions related to airborne exposure that require further evaluation or treatment, and any special provisions for use of personal protective clothing or equipment;

(ii) If the employee provides written authorization, the written opinion must also contain any recommended limitations on the employee's airborne exposure to beryllium.

(iii) If the employee is confirmed positive or diagnosed with CBD or if the licensed physician otherwise deems it appropriate, and the employee provides written authorization, the written opinion must also contain a referral for an evaluation at a CBD diagnostic center.

(iv) If the employee is confirmed positive or diagnosed with CBD and the employee provides written authorization, the written opinion must also contain a recommendation for continued periodic medical surveillance.

(v) If the employee is confirmed positive or diagnosed with CBD and the employee provides written authorization, the written opinion must also contain a recommendation for medical removal from airborne exposure to beryllium, as described in paragraph (l) of this standard.

(vi) The employer must ensure that each employee receives a copy of the written medical opinion described in paragraph (k)(6) of this standard within 45 days of any medical examination (including any follow-up BeLPT required under paragraph (k)(3)(ii)(E) of

this standard) performed for that employee.

(7) *CBD diagnostic center.* (i) The employer must provide an evaluation at no cost to the employee at a CBD diagnostic center that is mutually agreed upon by the employer and the employee. The examination must be provided within 30 days of:

(A) The employer's receipt of a physician's written medical opinion to the employer that recommends referral to a CBD diagnostic center; or

(B) The employee presenting to the employer a physician's written medical report indicating that the employee has been confirmed positive or diagnosed with CBD, or recommending referral to a CBD diagnostic center.

(ii) The employer must ensure that the employee receives a written medical report from the CBD diagnostic center that contains all the information required in paragraph (k)(5)(i), (ii), (iv), and (v) of this standard and that the PLHCP explains the results of the examination to the employee within 30 days of the examination.

(iii) The employer must obtain a written medical opinion from the CBD diagnostic center within 30 days of the medical examination. The written medical opinion must contain only the information in paragraph (k)(6)(i), as applicable, unless the employee provides written authorization to release additional information. If the employee provides written authorization, the written opinion must also contain the information from paragraphs (k)(6)(ii), (iv), and (v), if applicable.

(iv) The employer must ensure that each employee receives a copy of the written medical opinion from the CBD diagnostic center described in paragraph (k)(7) of this standard within 30 days of any medical examination performed for that employee.

(v) After an employee has received the initial clinical evaluation at a CBD diagnostic center described in paragraph (k)(7)(i) of this standard, the employee may choose to have any subsequent medical examinations for which the employee is eligible under paragraph (k) of this standard performed at a CBD diagnostic center mutually agreed upon by the employer and the employee, and the employer must provide such examinations at no cost to the employee.

(l) *Medical removal.* (1) An employee is eligible for medical removal, if the employee works in a job with airborne exposure at or above the action level and either:

(i) The employee provides the employer with:

(A) A written medical report indicating a confirmed positive finding or CBD diagnosis; or

(B) A written medical report recommending removal from airborne exposure to beryllium in accordance with paragraph (k)(5)(v) or (k)(7)(ii) of this standard; or

(ii) The employer receives a written medical opinion recommending removal from airborne exposure to beryllium in accordance with paragraph (k)(6)(v) or (k)(7)(iii) of this standard.

(2) If an employee is eligible for medical removal, the employer must provide the employee with the employee's choice of:

(i) Removal as described in paragraph (l)(3) of this standard; or

(ii) Remaining in a job with airborne exposure at or above the action level, provided that the employer provides, and ensures that the employee uses, respiratory protection that complies with paragraph (g) of this standard whenever airborne exposures are at or above the action level.

(3) If the employee chooses removal:

(i) If a comparable job is available where airborne exposures to beryllium are below the action level, and the employee is qualified for that job or can be trained within one month, the employer must remove the employee to that job. The employer must maintain for six months from the time of removal the employee's base earnings, seniority, and other rights and benefits that existed at the time of removal.

(ii) If comparable work is not available, the employer must maintain the employee's base earnings, seniority, and other rights and benefits that existed at the time of removal for six months or until such time that comparable work described in paragraph (l)(3)(i) becomes available, whichever comes first.

(4) The employer's obligation to provide medical removal protection benefits to a removed employee shall be reduced to the extent that the employee receives compensation for earnings lost during the period of removal from a publicly or employer-funded compensation program, or receives income from another employer made possible by virtue of the employee's removal.

(m) *Communication of hazards*—(1) *General.* (i) Chemical manufacturers, importers, distributors, and employers must comply with all requirements of the HCS (§ 1910.1200) for beryllium.

(ii) In classifying the hazards of beryllium, at least the following hazards must be addressed: Cancer; lung effects (CBD and acute beryllium disease); beryllium sensitization; skin sensitization; and skin, eye, and respiratory tract irritation.

(iii) Employers must include beryllium in the hazard communication program established to comply with the HCS. Employers must ensure that each employee has access to labels on containers of beryllium and to safety data sheets, and is trained in accordance with the requirements of the HCS (§ 1910.1200) and paragraph (m)(4) of this standard.

(2) *Warning signs.* (i) *Posting.* The employer must provide and display warning signs at each approach to a regulated area so that each employee is able to read and understand the signs and take necessary protective steps before entering the area.

(ii) *Sign specification.* (A) The employer must ensure that the warning signs required by paragraph (m)(2)(i) of this standard are legible and readily visible.

(B) The employer must ensure each warning sign required by paragraph (m)(2)(i) of this standard bears the following legend:

DANGER
REGULATED AREA
BERYLLIUM
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
AUTHORIZED PERSONNEL ONLY
WEAR RESPIRATORY PROTECTION AND
PERSONAL PROTECTIVE CLOTHING
AND EQUIPMENT IN THIS AREA

(3) *Warning labels.* Consistent with the HCS (§ 1910.1200), the employer must label each bag and container of clothing, equipment, and materials contaminated with beryllium, and must, at a minimum, include the following on the label:

DANGER
CONTAINS BERYLLIUM
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
AVOID CREATING DUST
DO NOT GET ON SKIN

(4) *Employee information and training.* (i) For each employee who has, or can reasonably be expected to have, airborne exposure to or dermal contact with beryllium:

(A) The employer must provide information and training in accordance with the HCS (§ 1910.1200(h));

(B) The employer must provide initial training to each employee by the time of initial assignment; and

(C) The employer must repeat the training required under this standard annually for each employee.

(ii) The employer must ensure that each employee who is, or can reasonably be expected to be, exposed to airborne beryllium can demonstrate

knowledge and understanding of the following:

(A) The health hazards associated with airborne exposure to and contact with beryllium, including the signs and symptoms of CBD;

(B) The written exposure control plan, with emphasis on the location(s) of beryllium work areas, including any regulated areas, and the specific nature of operations that could result in airborne exposure, especially airborne exposure above the TWA PEL or STEL;

(C) The purpose, proper selection, fitting, proper use, and limitations of personal protective clothing and equipment, including respirators;

(D) Applicable emergency procedures;

(E) Measures employees can take to protect themselves from airborne exposure to and contact with beryllium, including personal hygiene practices;

(F) The purpose and a description of the medical surveillance program required by paragraph (k) of this standard including risks and benefits of each test to be offered;

(G) The purpose and a description of the medical removal protection provided under paragraph (l) of this standard;

(H) The contents of the standard; and

(I) The employee's right of access to records under the Records Access standard (§ 1910.1020).

(iii) When a workplace change (such as modification of equipment, tasks, or procedures) results in new or increased airborne exposure that exceeds, or can reasonably be expected to exceed, either the TWA PEL or the STEL, the employer must provide additional training to those employees affected by the change in airborne exposure.

(iv) *Employee information.* The employer must make a copy of this standard and its appendices readily available at no cost to each employee and designated employee representative(s).

(n) *Recordkeeping*—(1) *Air monitoring data.* (i) The employer must make and maintain a record of all exposure measurements taken to assess airborne exposure as prescribed in paragraph (d) of this standard.

(ii) This record must include at least the following information:

(A) The date of measurement for each sample taken;

(B) The task that is being monitored;

(C) The sampling and analytical methods used and evidence of their accuracy;

(D) The number, duration, and results of samples taken;

(E) The type of personal protective clothing and equipment, including respirators, worn by monitored employees at the time of monitoring; and

(F) The name, social security number, and job classification of each employee represented by the monitoring, indicating which employees were actually monitored.

(iii) The employer must ensure that exposure records are maintained and made available in accordance with the Records Access standard (§ 1910.1020).

(2) *Objective data.* (i) Where an employer uses objective data to satisfy the exposure assessment requirements under paragraph (d)(2) of this standard, the employer must make and maintain a record of the objective data relied upon.

(ii) This record must include at least the following information:

(A) The data relied upon;

(B) The beryllium-containing material in question;

(C) The source of the objective data;

(D) A description of the process, task, or activity on which the objective data were based; and

(E) Other data relevant to the process, task, activity, material, or airborne exposure on which the objective data were based.

(iii) The employer must ensure that objective data are maintained and made available in accordance with the Records Access standard (§ 1910.1020).

(3) *Medical surveillance.* (i) The employer must make and maintain a record for each employee covered by medical surveillance under paragraph (k) of this standard.

(ii) The record must include the following information about each employee:

(A) Name, social security number, and job classification;

(B) A copy of all licensed physicians' written medical opinions for each employee; and

(C) A copy of the information provided to the PLHCP as required by paragraph (k)(4) of this standard.

(iii) The employer must ensure that medical records are maintained and made available in accordance with the Records Access standard (§ 1910.1020).

(4) *Training.* (i) At the completion of any training required by this standard, the employer must prepare a record that indicates the name, social security number, and job classification of each employee trained, the date the training was completed, and the topic of the training.

(ii) This record must be maintained for three years after the completion of training.

(5) *Access to records.* Upon request, the employer must make all records maintained as a requirement of this standard available for examination and copying to the Assistant Secretary, the Director, each employee, and each employee's designated representative(s) in accordance the Records Access standard (§ 1910.1020).

(6) *Transfer of records.* The employer must comply with the requirements involving transfer of records set forth in the Records Access standard (§ 1910.1020).

(o) *Dates*—(1) *Effective date.* This standard shall become effective March 10, 2017.

(2) *Compliance dates.* All obligations of this standard commence and become enforceable on March 12, 2018, except:

(i) Change rooms and showers required by paragraph (i) of this standard must be provided by March 11, 2019; and

(ii) Engineering controls required by paragraph (f) of this standard must be implemented by March 10, 2020.

(p) *Appendix.* Appendix A—Control Strategies to Minimize Beryllium Exposure of this standard is non-mandatory.

Appendix A to § 1910.1024—Control Strategies To Minimize Beryllium Exposure (Non-Mandatory)

Paragraph (f)(2)(i) of this standard requires employers to use one or more of the control methods listed in paragraph (f)(2)(i) to minimize worker exposure in each operation in a beryllium work area, unless the operation is exempt under paragraph (f)(2)(ii). This appendix sets forth a non-exhaustive list of control options that employers could use to comply with paragraph (f)(2)(i) for a number of specific beryllium operations.

TABLE A.1—EXPOSURE CONTROL RECOMMENDATIONS

Operation	Minimal control strategy *	Application group
Beryllium Oxide Forming (*e.g.*, pressing, extruding).	For pressing operations: (1) Install local exhaust ventilation (LEV) on oxide press tables, oxide feed drum breaks, press tumblers, powder rollers, and die set disassembly stations; (2) Enclose the oxide presses; and (3) Install mechanical ventilation (make-up air) in processing areas For extruding operations: (1) Install LEV on extruder powder loading hoods, oxide supply bottles, rod breaking operations, centerless grinders, rod laydown tables, dicing operations, surface grinders, discharge end of extrusion presses; (2) Enclose the centerless grinders; and (3) Install mechanical ventilation (make-up air) in processing areas.	Primary Beryllium Production; Beryllium Oxide Ceramics and Composites.
Chemical Processing Operations (*e.g.*, leaching, pickling, degreasing, etching, plating).	For medium and high gassing operations: (1) Perform operation with a hood having a maximum of one open side; and (2) Design process so as to minimize spills; if accidental spills occur, perform immediate cleanup.	Primary Beryllium Production; Beryllium Oxide Ceramics and Composites; Copper Rolling, Drawing and Extruding.
Finishing (*e.g.*, grinding, sanding, polishing, deburring).	(1) Perform portable finishing operations in a ventilated hood. The hood should include both downdraft and backdraft ventilation, and have at least two sides and a top. (2) Perform stationary finishing operations using a ventilated and enclosed hood at the point of operation. The grinding wheel of the stationary unit should be enclosed and ventilated.	Secondary Smelting; Fabrication of Beryllium Alloy Products; Dental Labs.
Furnace Operations (*e.g.*, Melting and Casting).	(1) Use LEV on furnaces, pelletizer; arc furnace ingot machine discharge; pellet sampling; arc furnace bins and conveyors; beryllium hydroxide drum dumper and dryer; furnace rebuilding; furnace tool holders; arc furnace tundish and tundish skimming, tundish preheat hood, and tundish cleaning hoods; dross handling equipment and drums; dross recycling; and tool repair station, charge make-up station, oxide screener, product sampling locations, drum changing stations, and drum cleaning stations (2) Use mechanical ventilation (make-up air) in furnace building	Primary Beryllium Production; Beryllium Oxide Ceramics and Composites; Nonferrous Foundries; Secondary Smelting.
Machining	Use (1) LEV consistent with ACGIH® ventilation guidelines on deburring hoods, wet surface grinder enclosures, belt sanding hoods, and electrical discharge machines (for operations such as polishing, lapping, and buffing); (2) high velocity low volume hoods or ventilated enclosures on lathes, vertical mills, CNC mills, and tool grinding operations; (3) for beryllium oxide ceramics, LEV on lapping, dicing, and laser cutting; and (4) wet methods (*e.g.*, coolants).	Primary Beryllium Production; Beryllium Oxide Ceramics and Composites; Copper Rolling, Drawing, and Extruding; Precision Turned Products.
Mechanical Processing (*e.g.*, material handling (including scrap), sorting, crushing, screening, pulverizing, shredding, pouring, mixing, blending).	(1) Enclose and ventilate sources of emission; (2) Prohibit open handling of materials; and (3) Use mechanical ventilation (make-up air) in processing areas	Primary Beryllium Production; Beryllium Oxide Ceramics and Composites; Aluminum and Copper Foundries; Secondary Smelting.
Metal Forming (*e.g.*, rolling, drawing, straightening, annealing, extruding).	(1) For rolling operations, install LEV on mill stands and reels such that a hood extends the length of the mill; (2) For point and chamfer operations, install LEV hoods at both ends of the rod; (3) For annealing operations, provide an inert atmosphere for annealing furnaces, and LEV hoods at entry and exit points; (4) For swaging operations, install LEV on the cutting head; (5) For drawing, straightening, and extruding operations, install LEV at entry and exit points; and (6) For all metal forming operations, install mechanical ventilation (make-up air) for processing areas.	Primary Beryllium Production; Copper Rolling, Drawing, and Extruding; Fabrication of Beryllium Alloy Products.
Welding	For fixed welding operations: (1) Enclose work locations around the source of fume generation and use local exhaust ventilation; and (2) Install close capture hood enclosure designed so as to minimize fume emission from the enclosure welding operation. For manual operations: (1) Use portable local exhaust and general ventilation	Primary Beryllium Production; Fabrication of Beryllium Alloy Products; Welding.

* All LEV specifications should be in accordance with the ACGIH® Publication No. 2094, "Industrial Ventilation—A Manual of Recommended Practice" wherever applicable.